

Date of Report: June 27, 2000

EPA Agreement Number: R82806001-0

Title: PM2.5 Technology Assessment and Characterization Study in New York State (PMTACS-NY)

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Institution: Atmospheric Sciences Research Center, University at Albany

Research Category: Particulate Matter EPA "Supersites" Program

Sorting Code: 99-NCERQA-X1

Project Period: January - March 2000

Objective of Research:

As a result of recent clinical and epidemiological studies (NRC, 1998) associating adverse health effects in humans and fine particle mass, a new National Ambient Air Quality Standard for PM_{2.5} mass (15 µg/m³ annual and 65 µg/m³ 24-hr average) has been promulgated in the United States (Federal Register, 1997). Significant scientific and technical issues surrounding the mitigation of the warm season PM_{2.5} /co-pollutant complex and its interdependence with O₃ air quality through coupled photochemical pathways, common precursors, and similar dependencies upon meteorology must be addressed if effective control strategies are to be implemented.

The long-term monitoring of the PM_{2.5}/co-pollutant complex and its precursors at urban and regional representative sites provides the opportunity to track the impact of emission controls and their effectiveness on air quality. These data can be used to verify that implemented PM_{2.5} primary and secondary precursor (including ozone precursor) emission controls are performing according to specifications and verify that PM_{2.5} and ozone air quality has responded to the emission changes achieved as expected. Without adequate monitoring systems to track the progress and effectiveness of implemented control programs, the air quality management approach remains unaccountable.

The PMTACS-NY Supersite program provides a unique and unparalleled opportunity to enhance our understanding of ozone/PM_{2.5}-precursor relationships and track progress in current precursor emission control programs and assess their effectiveness in achieving expected air quality responses. The impact of this research is highly significant, providing a sound scientific basis for informed effective decisions in the management of air quality in New York and will benefit its citizens both environmentally and economically.

The PMTACS-NY is designed around three major objectives and addresses a series of science policy relevant questions related to hypotheses to be tested using measurement

data collected under the program. The subject quarterly reports provide highlights on the overall program status, the progress made in the context of the specific tasks associated with the three program objectives, identification of outstanding issues, project schedule and completion status by task, and a budget analysis.

Progress Summary/Accomplishments:

Activity this quarter was associated mainly with project start-up which included: 1) participation in the Supersite Announcement Meeting, January 24-18, 2000, in Charleston, SC; 2) EPA 1st meeting of Supersite PIs, March 22-23, 2000, in Research Triangle Park; and 3) several Quality Assurance Program Plan (QAPP) related meetings. Preparation of the PMTACS-NY QAPP is underway with a target date of June 15 anticipated for a draft report for external review. Administrative activities included initiating a program sub award with Aerodyne Research, Inc. and preparing the necessary paperwork to access NYS Environmental Bond Act funds (part of the equipment cost share identified in PMTACS-NY).

Objective I. Measure the temporal and spatial distribution of the PM2.5/co-Pollutant complex including: SO₂, CO, VOCs/Air Toxics, NO, NO₂, O₃, NOy, H₂CO, HNO₃, HONO, PM2.5 (mass, SO₄⁼, NO₃⁻, OC, EC, Trace Elements), single particle aerosol composition, CN, OH and HO₂ to support regulatory requirements to develop cost effective mitigation strategies PM2.5 and its co-pollutants and to establish trends in the relevant precursor concentrations to assess the impact of recent and future emission reductions in terms of emission control effectiveness and air quality response.

During this start-up quarter activities focused mainly on the purchase of selected PM2.5 equipment (including R&P FRM mass, R&P TEOM mass and R&P PM Carbon) and site preparation for the installation of the subject equipment at our regional measurement sites: Pinnacle State Park and Whiteface Mountain. Recent developments regarding two of the originally proposed NYC urban sites (i.e. Mable Dean Bacon HS in Manhattan and Queensborough Community College in Queens) indicate that both sites may undergo construction and/or renovation over the next year. If this is the case, they may be unacceptable for the proposed program and alternate sites will have to be found. We have started visiting and reviewing other potential sites in the two boroughs in collaboration with the NYSDEC to identify possible alternate sites should a move be necessary.

Objective II. Monitor the effectiveness of new emission control technologies [i.e. Compressed Natural Gas (CNG) bus deployment and Continuously Regenerating Technology (CRT)] introduced in New York City and its impact on ambient air quality, thorough remote open path roadside, mobile platform, and fixed site measurements of CO₂, CO, NO, H₂CO, HONO, CN and aerosol chemical composition.

Initial preparations have begun in anticipation of the prototype demonstration study CNG/CRT Emission Perturbation Experiment (CEPEX) to be performed this fall in NYC. Discussions between NYSDEC emissions characterization group (R. Gibbs and T. Lanni), NYS DOT (J. Zamurs), Aerodyne Research, Inc.(C. Kolb, M. Zahniser, and D.

Worsnorp) and NYSERDA (J. Joseph, R. Drake, and R. Horton) were initiated to assess the control technologies that will be operational in the city during the prototype demonstration study and to prepare for a meeting to brief MTA on the CEPEX program.

Objective III. Test and evaluate new measurement technologies and provide tech-transfer of demonstrated operationally robust technologies for network operation in support of the development of process science and observation based analysis tools and health based exposure assessments.

The Atmospheric Sciences Research Center's (ASRC) aerosol generation and calibration laboratory developed as part of another research program is now complete and fully operational. One application of the laboratory is to evaluate and calibrate various PM/aerosol instrumentation and measurement systems, which is an integral part of the PMTACS-NY Supersite program. Aerosol generation capabilities include spray atomization of solutions for the generation of polydisperse aerosols in the 0.02 μ m to 1 μ m size range and monodisperse aerosols over this size range can be produced by mobility classification. Production of larger monodisperse aerosols (0.5 μ m to 20 μ m) is accomplished through the use of a Vibrating Orifice Aerosol Generator (TSI Model 3450). We now have demonstrated capability in the generation and physical characterization of both inorganic and organic test aerosols (NaCl, (NH₄)₂SO₄, CuSO₄, NH₄NO₃, and pinonic acid) over a broad range of concentrations, sizes and humidified environments.

Physical characterization of small test aerosols has also been demonstrated and includes concentration measurement using several condensation nucleus counters as well size distribution measurements with a mobility spectrometer (TSI Model 3080L). Concentrations and sizes of larger aerosols are obtained using optical scattering instruments (PMS ASASP-X). The combination of these instruments allows a detailed size and concentration characterization over the size range 20 nm to greater than 1 μ m.

Publications/Presentations: PMTACS-NY program overview presentation at PM2000: Particulate Matter and Health Conference, Charleston, SC, January 24-28, 2000 and EPA Supersite Principal Investigators Meeting, March 22-23, 2000, Research Triangle Park, NC.

Future Activities and Outstanding Issues:

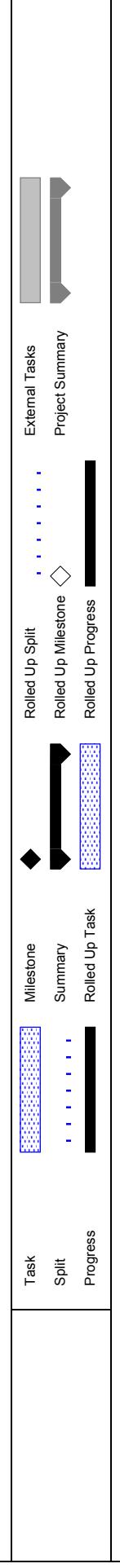
Delays in receipt of the NYSDEC Environmental Bond Act Funds, a major component of the equipment cost share for this project, has impacted our scheduled purchase of several major pieces of equipment. The delays raise potential concerns regarding the purchase of long lead-time (6-9 months) equipment (e.g. TILDAS and AMS) needed for the 2001 summer intensive studies. We hope to have this problem resolved soon. Existing NYC monitoring site renovation and construction issues may require relocation of the Mable Dean Bacon and Queensborough Community College monitoring sites and as a result delay deployment and measurement operations in the boroughs of Manhattan and Queens. In addition, NYS would like to deploy R&P M2300 sequential filter samplers for

its chemical speciation network. Discussions have been initiated amongst all the interested parties to determine what needs to be accomplished to bring these samplers on line.

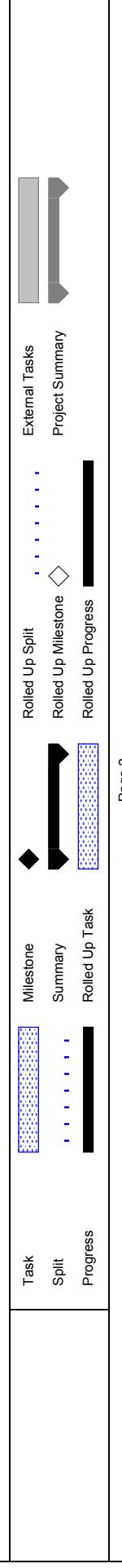
Supplemental Keywords: ambient air, atmospheric aerosols, ozone, particulate matter, metals, nitrogen oxides, sulfates, organics, atmospheric chemistry, monitoring, measurement methods, northeast air quality.

Relevant Web Sites:

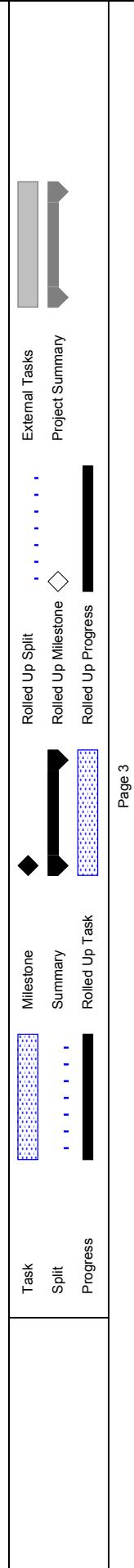
ID	①	Task Name	Start	2000 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2001 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2002 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2003 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2004 Qtr 1	Qtr 2	Qtr 3	Qtr 4	
1		TASK 1 Planning and Coordination Meetings	Tue 2/8/00																					
2	✓	EPA - Supersite PIs Kick Off Meeting RTP, NC	Wed 3/22/00																					
3	✓	Eastern States - Supersites Coordination Meeting	Wed 4/12/00																					
4	↻	Supersite EPA Liaison and Science Advisory Meetings	Wed 2/7/01																					
9	↻	Supersite Work Group Participation and EPA Collaboration	Tue 2/8/00																					
29		Meetings with Aerodyne and MTA - Coordination of CEPEX Study	Tue 4/4/00																					
30		TASK 2 Preparation of Quality Assurance Project Plan (QAPP)	Mon 2/7/00																					
31	█	QA Project and SS Meetings	Mon 2/7/00																					
32		Compilation and Development of SOPs	Mon 2/7/00																					
33		Draft QAPP submitted for EPA Review and Comment	Mon 2/7/00																					
34	█	Revisions and Final EPA Approved QAPP	Mon 7/3/00																					
35		TASK 3 Major Equipment Purchases and Instrument Fabrication	Mon 2/7/00																					
36	█	Secure NYS Bond Act Funds for PM Analytical Facilities	Mon 2/7/00																					
37	✓	Order R&P Continuous PM Carbon Instrument and PM Nitrate	Mon 5/8/00																					
38	█	Build NO2 (Photolytic Titration) measurement Systems	Wed 3/15/00																					
39		Review status and order Sequential Chemical Speciation Samplers	Wed 3/1/00																					
40		Site Renovations and Power Upgrades at Selected Sites as Needed	Mon 2/7/00																					
41		Site Installation of new instrumentation technologies	Wed 3/15/00																					
42		TASK 4 Network Operations	Mon 2/7/00																					
43	█	Deploy and Operate EPA Designated Criteria Pollutant Measurements	Mon 2/7/00																					
44	█	Deploy and Operate Filter Based Chemical Speciation Measurements	Thu 8/17/00																					
45	█	Deploy and Operate New Continuous PM Chemical Speciation Measurement Instrumentation	Tue 7/18/00																					
46	█	Deploy and Operate New Continuous PM Mass Measurement Instrumentation	Mon 7/24/00																					
47		TASK 5 CEPEX Field Studies	Wed 3/15/00																					
48	█	CEPEX Planning Site Selection and Deployment Routes	Wed 3/15/00																					
49	█	CEPEX Mobile Laboratory Deployment - Proof of Concept Study	Mon 9/25/00																					
50	█	Demonstration of In Situ Emissions Measurement Technologies	Thu 12/28/00																					
51	█	CEPEX 2001 Summer Field Intensive	Mon 7/2/01																					



ID	①	Task Name	Start	2000 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2001 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2002 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2003 Qtr 1	Qtr 2	Qtr 3	Qtr 4	2004 Qtr 1	Qtr 2	Qtr 3	Qtr 4	
52	①	TASK 6 Special Studies - 2001 Summer Field Campaign	Mon 7/2/01																					
53	②	Deployment and Operation of OH/HO2 Instrumentation - PSU	Mon 7/2/01																					
54	②	Deployment, Operation and Intercomparison of Single Particle Aerosol - Mass Spectrometers	Mon 7/2/01																					
55	②	Deployment and Operation of a Continuous HONO/HONO2 Measurement System	Mon 7/2/01																					
56	②	Deployment and Operation of Aerosol Particle Sizing Instrumentation	Mon 7/2/01																					
57	①	TASK 7 Special Studies - 2003 Winter Field Campaign	Mon 2/17/03																					
58	②	Deployment and Operation of OH/HO2 Instrumentation - PSU	Mon 2/17/03																					
59	②	Deployment, Operation and Intercomparison of Single Particle Aerosol - Mass Spectrometers	Mon 2/17/03																					
60	②	Deployment and Operation of a Continuous HONO/HONO2 Measurement System	Mon 2/17/03																					
61	②	Deployment and Operation of Aerosol Particle Sizing Instrumentation	Mon 2/17/03																					
62	①	TASK 8 Data Quality Assessment and Management	Mon 2/14/00																					
63	②	Participation in Data Management Working Group	Mon 2/14/00																					
92	②	Development and implementation of data management protocols and standards	Mon 3/6/00																					
93	②	Compilation, Archive and Distribution of Measurement Data Sets	Mon 2/12/01																					
102	②	QA Experiments and Intercomparison Studies	Mon 9/11/00																					
109	①	TASK 9 Aerosol Generation, Calibration and Instrument Evaluation	Tue 2/15/00																					
110	②	Generation of size selected pure inorganic and organic aerosol calibrants	Tue 2/15/00																					
111	②	Generation of size selected pure inorganic and organic aerosol calibrants in 10-95% RH	Tue 2/15/00																					
112	②	Laboratory evaluation of Nafion dryer retrofitted R&P TEOM PM2.5 mass monitors	Wed 5/17/00																					
113	②	Laboratory evaluation of R&P continuous PM2.5 carbon and nitrate analyzers	Fri 11/3/00																					
114	②	Laboratory evaluation of R&P differential dual ESP TEOM PM2.5 mass monitor	Mon 10/15/01																					
115	②	Laboratory evaluation of Aerodyne Aerosol Mass Spectrometer	Mon 2/12/01																					
116	①	TASK 10 Data Analysis and Hypothesis Testing	Mon 9/18/00																					
117	②	Trends in historical and PMTACS measurements of PM mass and SO4= and NO3- species provide (Mon 12/4/00																					
118	②	PM10/PM2.5 sulfate and nitrate production efficiencies are directly proportional with ozone productio	Tue 9/4/01																					
119	②	PM Fe/Mg ratios provide an effective signature of oil derived combustion aerosol.	Mon 2/4/02																					
120	②	PM V/Se ratios provide an effective signature of coal vs. oil derived aerosol on the regional scale.	Mon 2/4/02																					
121	②	PM As/Se ratios provide an effective signature of mid-western vs. Canadian derived aerosols	Tue 1/30/01																					



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122	②	Enhanced PM composition and gas phase measurements provide an effective means for distinguish	Mon 10/8/01					
123	③	NYC summertime SO4 is dominated by local SO2 gas to particle transformation	Tue 7/3/01					
124	④	Regional SO4 in New York State is dominated by long range transport of transformed SO2 emission:	Thu 2/1/01					
125	⑤	Bioogenic hydrocarbons represent a significant source of the semi-volatile organic matter mass fractio	Mon 9/18/00					
126	⑥	Changes in ambient PM sulfate mass fraction are anti-correlated with changes in the ambient PM nit	Thu 10/19/00					
127	⑦	CNG-fueled buses in New York City show measurable reductions of vehicle NO, SO2 and PM emiss	Thu 12/28/00					
128	⑧	CRT control technology with low sulfur fuels in retrofitted diesel buses in New York City shown meas	Thu 2/22/01					
129	⑨	The deployment of CNG-fueled and CRT-retrofitted diesel fleets show measurable reductions in amnt	Fri 4/20/01					
130	⑩	The EPA designated filter based reference method underestimates the actual atmospheric PM2.5 m	Tue 4/3/01					
131	⑪	Water management and temperature control of existing continuous automated mass, total sulfur and	Thu 5/31/01					
132	⑫	Measurements of the optical properties of the atmosphere (aerosol light scattering and absorption) u	Thu 12/12/02					
133	⑬	Quantitative amounts of gaseous pollutants (e.g. PAH, H2CO, xylenes, trichlorethylene, etc.) are absen	Tue 10/29/02					
134	⑭	PM chemical composition varies by aerodynamic size, which in turn varies in time, and with temperat	Tue 12/17/02					
135	⑮	Heterogeneous processes contributed to the oxidizing capacity of the atmosphere resulting in signific	Mon 12/16/02					
136	⑯	TASK 11 Reporting	Mon 2/7/00					
137	⑰	Quarterly Letter Report	Mon 5/15/00					
152	⑱	QAPP Report	Mon 2/7/00					
153	⑲	QAPP V.1.0	Mon 2/7/00					
154	⑳	QAPP Revisions as needed (QAPP V1.1,..., V2.0,...etc)	Mon 7/17/00					
155	㉑	Conference Presentations and Publications	Wed 2/7/01					
156	㉒	AGU Fall Meeting	Wed 2/7/01					
161	㉓	Preparation and Submission of Peer Review Publications	Wed 2/7/01					



PMTACS-NY EPA Supersite Program Budget Analysis

